```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
from google.colab import files
uploaded = files.upload()
```

Choose Files House Price India.csv

- **House Price India.csv**(text/csv) - 1524561 bytes, last modified: 9/26/2023 - 100% done

```
Saving House Price India.csv to House Price India.csv
```

```
import io
df = pd.read_csv(io.BytesIO(uploaded['House Price India.csv']))
```

```
df.head()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...	Buil Yea
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	192
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	190
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	...	193
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	...	200
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	...	192

5 rows × 23 columns

```
df.tail()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...
14615	6762830250	42734	2	1.5	1556	20000	1.0	0	0	4	...
14616	6762830339	42734	3	2.0	1680	7000	1.5	0	0	4	...
14617	6762830618	42734	2	1.0	1070	6120	1.0	0	0	3	...
14618	6762830709	42734	4	1.0	1030	6621	1.0	0	0	4	...
14619	6762831463	42734	3	1.0	900	4770	1.0	0	0	3	...

5 rows × 23 columns

```
df
```

```
                       number                        number                number  condition
           id   Date     of    number of  living  lot   of    waterfront     of     of the  ...
```

```
df.columns
```

```
Index(['id', 'Date', 'number of bedrooms', 'number of bathrooms',
       'living area', 'lot area', 'number of floors', 'waterfront present',
       'number of views', 'condition of the house', 'grade of the house',
       'Area of the house(excluding basement)', 'Area of the basement',
       'Built Year', 'Renovation Year', 'Postal Code', 'Lattitude',
       'Longitude', 'living_area_renov', 'lot_area_renov',
       'Number of schools nearby', 'Distance from the airport', 'Price'],
      dtype='object')
```

```
df.dtypes
```

```
id                                          int64
Date                                        int64
number of bedrooms                          int64
number of bathrooms                       float64
living area                                 int64
lot area                                    int64
number of floors                          float64
waterfront present                          int64
number of views                             int64
condition of the house                      int64
grade of the house                          int64
Area of the house(excluding basement)      int64
Area of the basement                        int64
Built Year                                  int64
Renovation Year                             int64
Postal Code                                 int64
Lattitude                                 float64
Longitude                                 float64
living_area_renov                           int64
lot_area_renov                              int64
Number of schools nearby                    int64
Distance from the airport                   int64
Price                                       int64
dtype: object
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 14620 entries, 0 to 14619
Data columns (total 23 columns):
 #   Column                                 Non-Null Count  Dtype  
---  ------                                 --------------  -----  
 0   id                                     14620 non-null  int64  
 1   Date                                   14620 non-null  int64  
 2   number of bedrooms                     14620 non-null  int64  
 3   number of bathrooms                    14620 non-null  float64
 4   living area                            14620 non-null  int64  
 5   lot area                               14620 non-null  int64  
 6   number of floors                       14620 non-null  float64
 7   waterfront present                     14620 non-null  int64  
 8   number of views                        14620 non-null  int64  
 9   condition of the house                 14620 non-null  int64  
 10  grade of the house                     14620 non-null  int64  
 11  Area of the house(excluding basement)  14620 non-null  int64  
 12  Area of the basement                   14620 non-null  int64  
 13  Built Year                             14620 non-null  int64  
 14  Renovation Year                        14620 non-null  int64  
 15  Postal Code                            14620 non-null  int64  
 16  Lattitude                              14620 non-null  float64
 17  Longitude                              14620 non-null  float64
 18  living_area_renov                      14620 non-null  int64  
 19  lot_area_renov                         14620 non-null  int64  
 20  Number of schools nearby               14620 non-null  int64  
 21  Distance from the airport              14620 non-null  int64  
 22  Price                                  14620 non-null  int64  
dtypes: float64(4), int64(19)
memory usage: 2.6 MB
```

```
df.shape
```

```
(14620, 23)
```

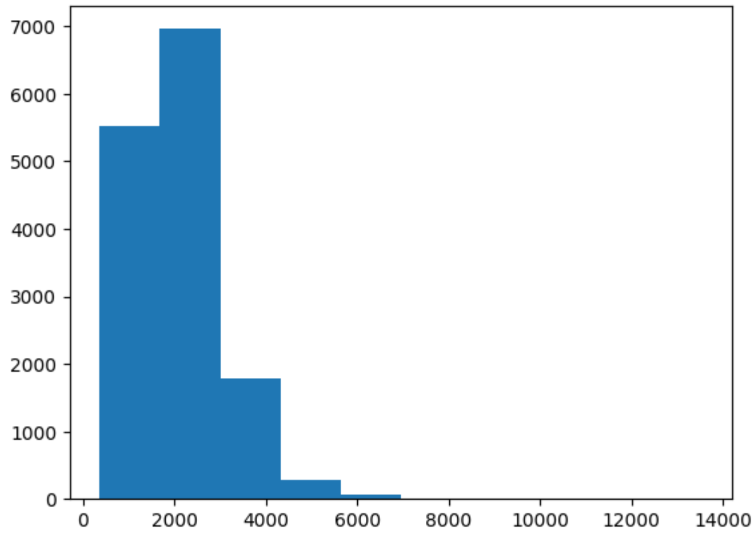
```
print(df.describe())
```

```
std    6.237575e+03     67.347991           0.938719            0.769934
```

```
75%    6.762826e+09  42662.000000           4.000000            2.500000
max    6.762832e+09  42734.000000          33.000000            8.000000

        living area      lot area  number of floors  waterfront present  \
count  14620.000000  1.462000e+04      14620.000000        14620.000000
mean    2098.262996  1.509328e+04          1.502360            0.007661
std      928.275721  3.791962e+04          0.540239            0.087193
min      370.000000  5.200000e+02          1.000000            0.000000
25%     1440.000000  5.010750e+03          1.000000            0.000000
50%     1930.000000  7.620000e+03          1.500000            0.000000
75%     2570.000000  1.080000e+04          2.000000            0.000000
max    13540.000000  1.074218e+06          3.500000            1.000000

       number of views  condition of the house  ...    Built Year  \
count     14620.000000            14620.000000  ...  14620.000000
mean          0.233105                3.430506  ...   1970.926402
std           0.766259                0.664151  ...     29.493625
min           0.000000                1.000000  ...   1900.000000
25%           0.000000                3.000000  ...   1951.000000
50%           0.000000                3.000000  ...   1975.000000
75%           0.000000                4.000000  ...   1997.000000
max           4.000000                5.000000  ...   2015.000000

       Renovation Year    Postal Code     Lattitude     Longitude  \
count     14620.000000   14620.000000  14620.000000  14620.000000
mean         90.924008  122033.062244     52.792848   -114.404007
std         416.216661      19.082418      0.137522      0.141326
min           0.000000  122003.000000     52.385900   -114.709000
25%           0.000000  122017.000000     52.707600   -114.519000
50%           0.000000  122032.000000     52.806400   -114.421000
75%           0.000000  122048.000000     52.908900   -114.315000
max        2015.000000  122072.000000     53.007600   -113.505000

       living_area_renov  lot_area_renov  Number of schools nearby  \
count       14620.000000    14620.000000              14620.000000
mean         1996.702257    12753.500068                  2.012244
std           691.093366    26058.414467                  0.817284
min           460.000000      651.000000                  1.000000
25%          1490.000000     5097.750000                  1.000000
50%          1850.000000     7620.000000                  2.000000
75%          2380.000000    10125.000000                  3.000000
max          6110.000000   560617.000000                  3.000000

       Distance from the airport         Price
count               14620.000000  1.462000e+04
mean                   64.950958  5.389322e+05
std                     8.936008  3.675324e+05
min                    50.000000  7.800000e+04
25%                    57.000000  3.200000e+05
50%                    65.000000  4.500000e+05
75%                    73.000000  6.450000e+05
max                    80.000000  7.700000e+06

[8 rows x 23 columns]
```

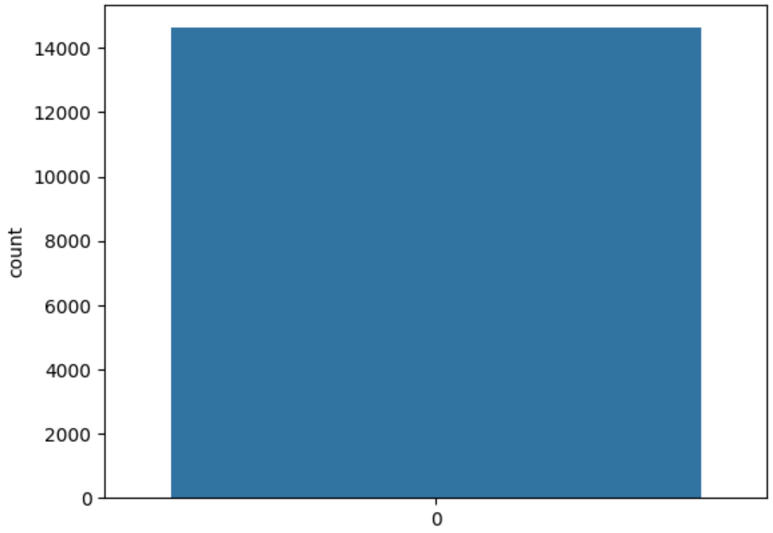
```
plt.hist(df['living area'])
```

```
(array([5.530e+03, 6.958e+03, 1.779e+03, 2.770e+02, 5.500e+01, 1.400e+01,
        2.000e+00, 3.000e+00, 1.000e+00, 1.000e+00]),
 array([  370.,  1687.,  3004.,  4321.,  5638.,  6955.,  8272.,  9589.,
        10906., 12223., 13540.]),
 <BarContainer object of 10 artists>)
```



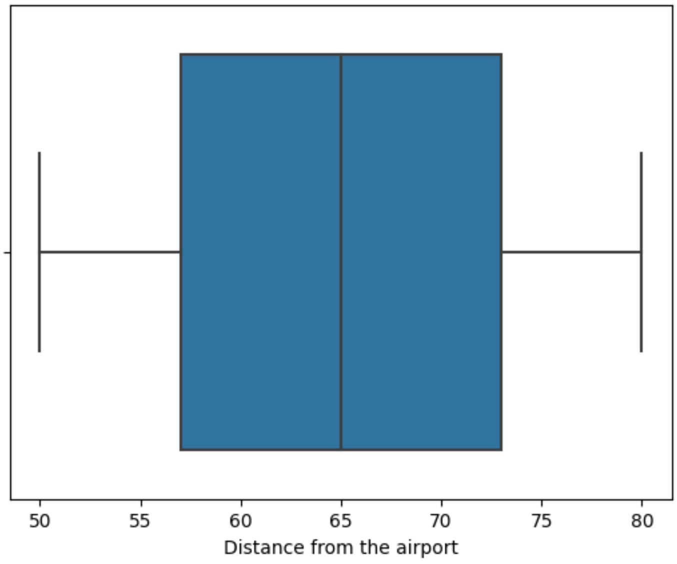
```
sns.countplot(df['condition of the house'])
```

```
<Axes: ylabel='count'>
```



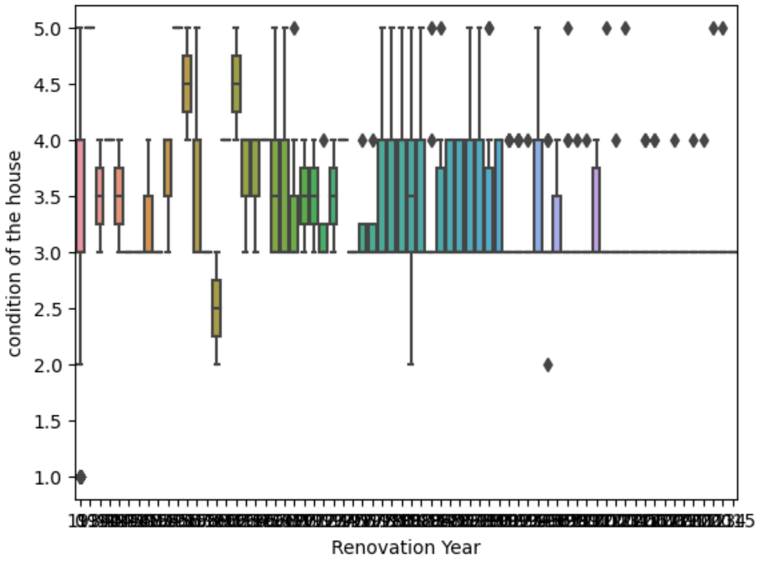
```
sns.boxplot(x=df['Distance from the airport'])
```

```
<Axes: xlabel='Distance from the airport'>
```



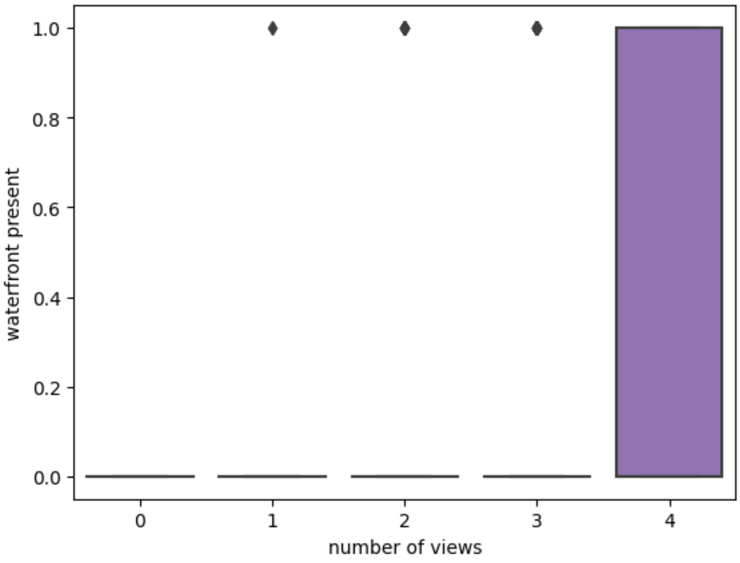
```
sns.boxplot(x=df['Renovation Year'],y=df['condition of the house'])
```

```
<Axes: xlabel='Renovation Year', ylabel='condition of the house'>
```



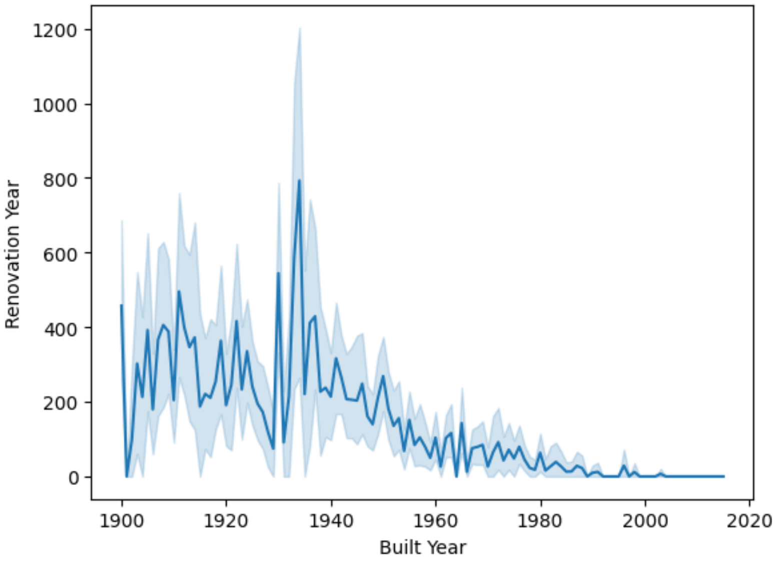
```
sns.boxplot(x=df['number of views'],y=df['waterfront present'])
sns.boxplot(x=df['number of views'],y=df['waterfront present'])
```

```
<Axes: xlabel='number of views', ylabel='waterfront present'>
```



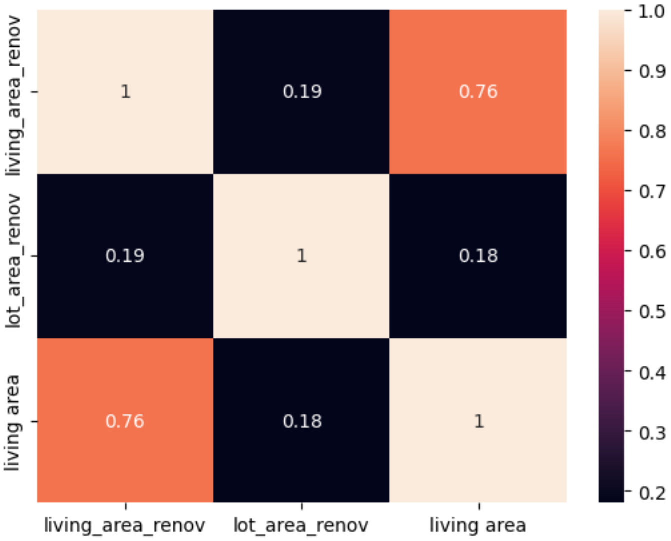
```
sns.lineplot(x=df['Built Year'],y=df['Renovation Year'])
```

```
<Axes: xlabel='Built Year', ylabel='Renovation Year'>
```



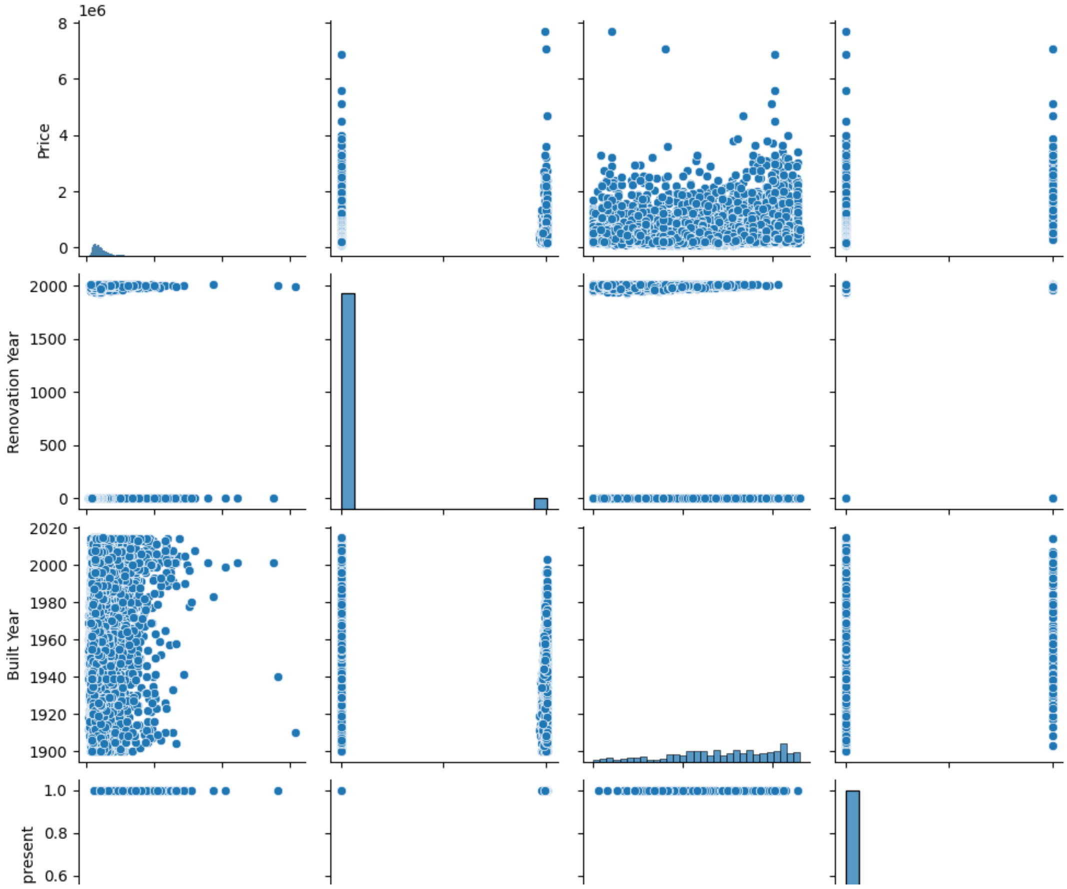
```
sns.heatmap(df[['living_area_renov','lot_area_renov','living area']].corr(),annot=T
```

```
<Axes: >
```

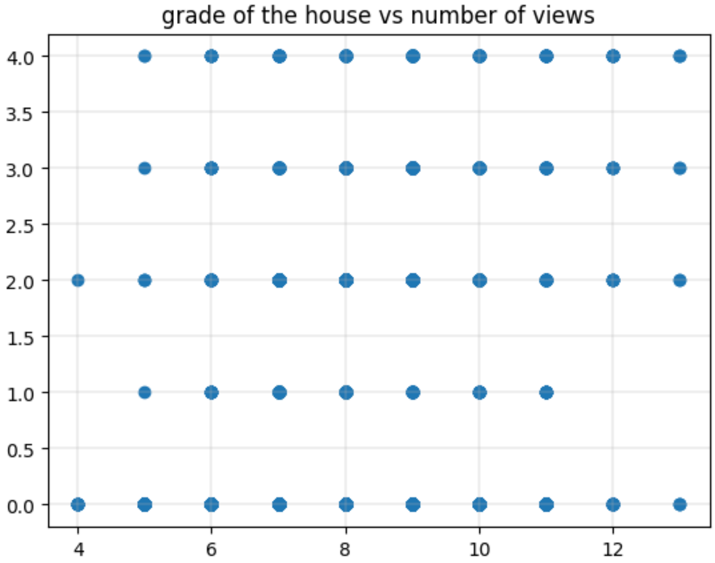


```
sns.pairplot(df[['Price','Renovation Year','Built Year','waterfront present']])
```

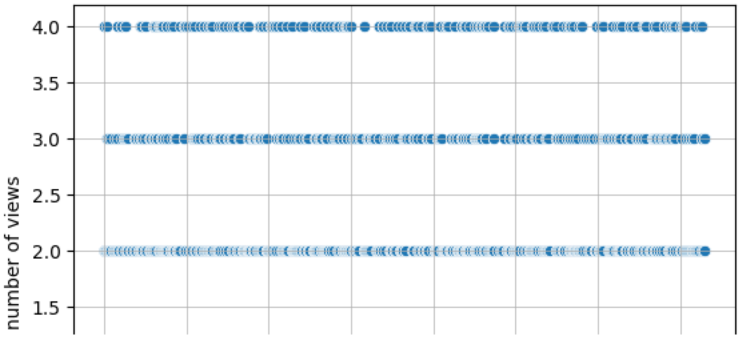
```
<seaborn.axisgrid.PairGrid at 0x7ddf24017fd0>
```



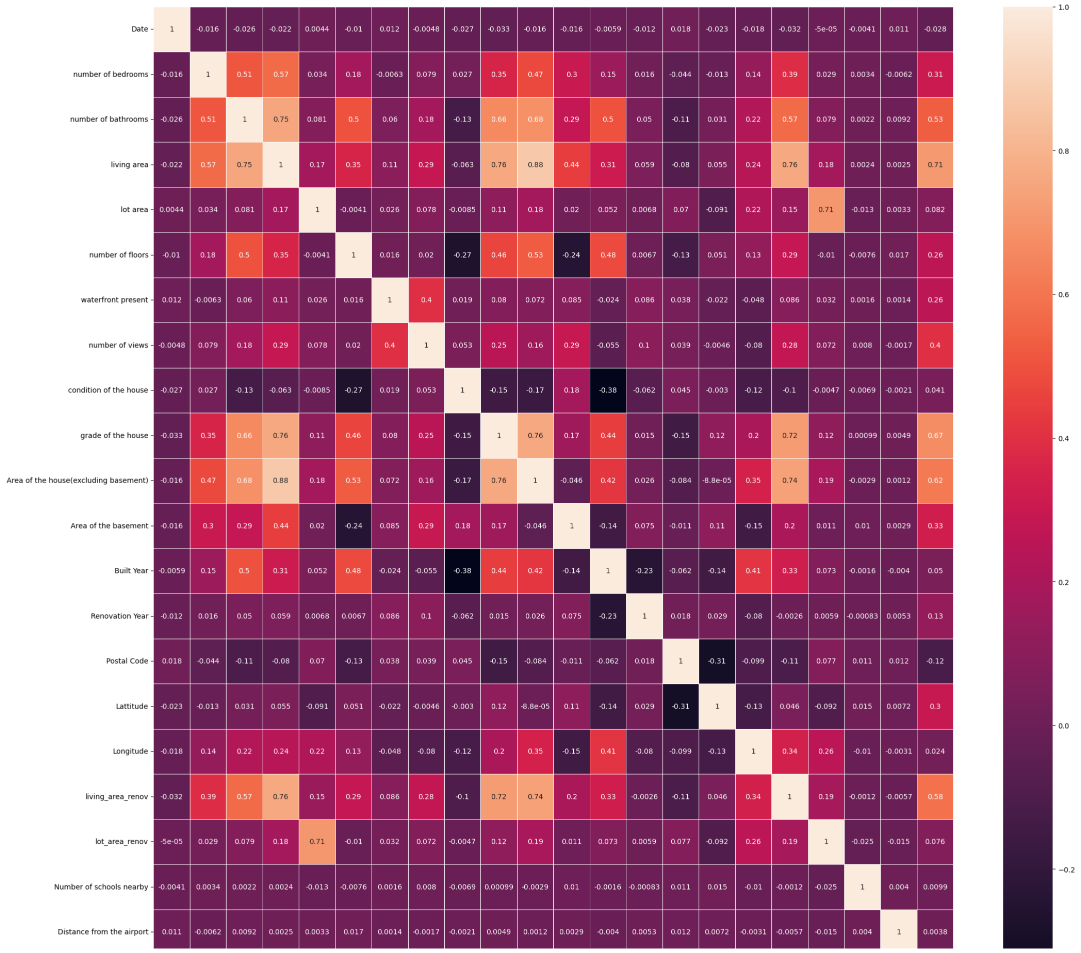
```
plt.scatter(df['grade of the house'],df['number of views'])
plt.title("grade of the house vs number of views")
plt.grid(linestyle='-', linewidth=0.3)
```



```
sns.scatterplot(df['number of views'])
plt.grid(linestyle='-',linewidth=0.5)
```



```
plt.subplots(figsize=(25,25))
sns.heatmap(df.drop(['id'],axis=1).corr(),linewidth=0.4,annot=True)
plt.show()
```



```
print(df.describe())
```

```
    std    6.237575e+03     67.347991           0.938719           0.769934
    min    6.762810e+09  42491.000000           1.000000           0.500000
    25%    6.762815e+09  42546.000000           3.000000           1.750000
    50%    6.762821e+09  42600.000000           3.000000           2.250000
    75%    6.762826e+09  42662.000000           4.000000           2.500000
    max    6.762832e+09  42734.000000          33.000000           8.000000

           living area      lot area  number of floors  waterfront present  \
    count  14620.000000  1.462000e+04      14620.000000        14620.000000
    mean    2098.262996  1.509328e+04          1.502360            0.007661
    std      928.275721  3.791962e+04          0.540239            0.087193
    min      370.000000  5.200000e+02          1.000000            0.000000
    25%     1440.000000  5.010750e+03          1.000000            0.000000
    50%     1930.000000  7.620000e+03          1.500000            0.000000
    75%     2570.000000  1.080000e+04          2.000000            0.000000
    max    13540.000000  1.074218e+06          3.500000            1.000000

          number of views  condition of the house  ...   Built Year  \
    count     14620.000000            14620.000000  ...  14620.000000
    mean          0.233105                3.430506  ...   1970.926402
    std           0.766259                0.664151  ...     29.493625
    min           0.000000                1.000000  ...   1900.000000
```

```
max           4.000000                5.000000  ...   2015.000000

       Renovation Year    Postal Code     Lattitude     Longitude  \
count     14620.000000   14620.000000  14620.000000  14620.000000
mean         90.924008  122033.062244     52.792848   -114.404007
std         416.216661      19.082418      0.137522      0.141326
min           0.000000  122003.000000     52.385900   -114.709000
25%           0.000000  122017.000000     52.707600   -114.519000
50%           0.000000  122032.000000     52.806400   -114.421000
75%           0.000000  122048.000000     52.908900   -114.315000
max        2015.000000  122072.000000     53.007600   -113.505000

       living_area_renov  lot_area_renov  Number of schools nearby  \
count       14620.000000    14620.000000              14620.000000
mean         1996.702257    12753.500068                  2.012244
std           691.093366    26058.414467                  0.817284
min           460.000000      651.000000                  1.000000
25%          1490.000000     5097.750000                  1.000000
50%          1850.000000     7620.000000                  2.000000
75%          2380.000000    10125.000000                  3.000000
max          6110.000000   560617.000000                  3.000000

       Distance from the airport         Price
count               14620.000000  1.462000e+04
mean                   64.950958  5.389322e+05
std                     8.936008  3.675324e+05
min                    50.000000  7.800000e+04
25%                    57.000000  3.200000e+05
50%                    65.000000  4.500000e+05
75%                    73.000000  6.450000e+05
max                    80.000000  7.700000e+06

[8 rows x 23 columns]
```

```
print(df.count())
```

```
id                                       14620
Date                                     14620
number of bedrooms                       14620
number of bathrooms                      14620
living area                              14620
lot area                                 14620
number of floors                         14620
waterfront present                       14620
number of views                          14620
condition of the house                   14620
grade of the house                       14620
Area of the house(excluding basement)    14620
Area of the basement                     14620
Built Year                               14620
Renovation Year                          14620
Postal Code                              14620
Lattitude                                14620
Longitude                                14620
living_area_renov                        14620
lot_area_renov                           14620
Number of schools nearby                 14620
Distance from the airport                14620
Price                                    14620
dtype: int64
```

```
print(df.corr())
```

```
Lattitude                                         0.014949
Longitude                                        -0.010163
living_area_renov                                -0.001203
lot_area_renov                                   -0.025014
Number of schools nearby                          1.000000
Distance from the airport                         0.004035
Price                                             0.009890

                                       Distance from the airport     Price
id                                                    -0.004542 -0.773114
Date                                                   0.011457 -0.027919
number of bedrooms                                    -0.006157  0.308460
number of bathrooms                                    0.009206  0.531735
living area                                            0.002511  0.712169
lot area                                               0.003291  0.081992
number of floors                                       0.016567  0.262732
waterfront present                                     0.001448  0.263687
number of views                                       -0.001657  0.395973
condition of the house                                -0.002136  0.041376
grade of the house                                     0.004940  0.671814
Area of the house(excluding basement)                  0.001222  0.615220
Area of the basement                                   0.002926  0.330202
Built Year                                            -0.003968  0.050307
Renovation Year                                        0.005342  0.133173
Postal Code                                            0.011528 -0.115908
Lattitude                                              0.007193  0.297490
Longitude                                             -0.003100  0.024414
living_area_renov                                     -0.005673  0.584924
lot_area_renov                                        -0.014587  0.075535
Number of schools nearby                               0.004035  0.009890
Distance from the airport                              1.000000  0.003804
Price                                                  0.003804  1.000000

[23 rows x 23 columns]
```

```
print(df['number of views'].value_counts())
```

```
0    13198
2      636
3      351
1      219
4      216
Name: number of views, dtype: int64
```

```
print('Mean:',df['Number of schools nearby'].mean())
print('Median:',df['Distance from the airport'].median())
print('Mode:',df['Postal Code'].mode())
```

```
Mean: 2.0122435020519838
Median: 65.0
Mode: 0    122028
Name: Postal Code, dtype: int64
```

```
print(df.isnull().sum())
```

```
id                                       0
Date                                     0
number of bedrooms                       0
number of bathrooms                      0
living area                              0
lot area                                 0
number of floors                         0
waterfront present                       0
number of views                          0
condition of the house                   0
grade of the house                       0
Area of the house(excluding basement)    0
Area of the basement                     0
Built Year                               0
Renovation Year                          0
Postal Code                              0
Lattitude                                0
Longitude                                0
living_area_renov                        0
lot_area_renov                           0
Number of schools nearby                 0
Distance from the airport                0
Price                                    0
dtype: int64
```

```
df.dropna(inplace=True)
df.fillna(0,inplace=True)
df.interpolate(inplace=True)
```

```
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import MinMaxScaler
x=df.drop(['Price','Date'],axis=1)
x.set_index(['id'],inplace=True)
y=df[['id','Price']]
```

```
x.head()
```

	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	grade of the house	Area of house(exclud baseme
id										
6762810145	5	2.50	3650	9050	2.0	0	4	5	10	3
6762810635	4	2.50	2920	4000	1.5	0	0	5	8	1
6762810998	5	2.75	2910	9480	1.5	0	0	3	8	2
6762812605	4	2.50	3310	42998	2.0	0	0	3	9	3
6762812919	3	2.00	2710	4500	1.5	0	0	4	8	1

```
y.head()
```

	id	Price
0	6762810145	2380000
1	6762810635	1400000
2	6762810998	1200000
3	6762812605	838000
4	6762812919	805000

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.metrics import r2_score
x_train,x_test,y_train,y_test = train_test_split(x,y['Price'],test_size =0.1,random_state=2)
model = GradientBoostingRegressor(n_estimators=400,max_depth=5,min_samples_split=2,learning_rate=0.1)
model.fit(x_train,y_train)
```

```
▾                GradientBoostingRegressor
GradientBoostingRegressor(max_depth=5, n_estimators=400)
```

```
y_pred = model.predict(x_test)
model.score(x_test,y_test)
```

```
0.9115605737002777
```

```
r2_score(y_pred,y_test)
```

```
0.9008207044846054
```

```
y_pred
```

```
array([497766.12740438, 244495.3776842 , 293819.40063242, ...,
       698495.60350629, 297006.00386358, 245881.76921871])
```

```
y_pred_list = y['id'][-len(y_pred):].tolist()
y_pred_df=pd.DataFrame(y_pred_list,columns=['ID'])
y_pred_df['Predicted Price']= y_pred.round(2)
```

```
y_pred_df
```

```
              ID  Predicted Price
0     6762811233        497766.13
1     6762811403        244495.38
2     6762811775        293819.40
3     6762811861        397555.35
4     6762812009        474843.29
...          ...              ...
1457  6762830250       1041014.57
1458  6762830339        317512.59
1459  6762830618        698495.60
1460  6762830709        297006.00
1461  6762831463        245881.77

1462 rows × 2 columns
```